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PATENT ABSTRACTS OF JAPAN

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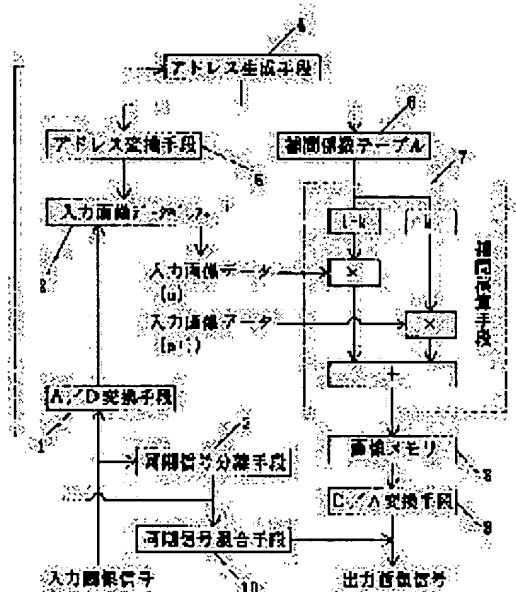
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(54) IMAGE DISTORTION CORRECTION SYSTEM

(57)Abstract:

PURPOSE: To prevent picture elements from being deteriorated even when a wide angle lens is used by correcting image distortion by address conversion and finding out the value of a picture element on a converted address by interpolating calculation between adjacent picture elements.

CONSTITUTION: An input image signal is digitized by an A/D conversion means 1 and a picture address is formed by an address forming means 4 based upon a synchronizing signal separated by a synchronizing signal separating means 3. The picture address is converted by an address converting means 5 to correct image distortion. Then the value of a picture element is interpolated by an interpolating operation means 6 based upon the converted picture address. The interpolated picture element value is stored in an image memory 8 and converted into an analog signal by a D/A conversion means 9 and the analog signal is mixed with the synchronizing signal by a synchronizing signal mixing means 10. Consequently the image distortion included in the input image signal is corrected and an output image signal with high picture quality can be obtained.



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CLAIMS

[Claim(s)]

[Claim 1] An A/D-conversion means to digitize an input picture signal, and a synchronizing signal separation means to separate a synchronizing signal from an input picture signal, An address-generation means to generate the screen address from a synchronizing signal, and an address translation means to change the screen address so that an image distortion may be amended, The interpolation operation means which carries out the interpolation operation of the value of a pixel based on the screen address after conversion, The image-distortion amendment method characterized by having the image memory which memorizes the value of the pixel by which the interpolation operation was carried out, a D/A conversion means to analog-ize the value of the pixel memorized in the image memory, and a synchronizing signal mixing means to mix a synchronizing signal to the analog-ized picture signal.

[Claim 2] The image-distortion amendment method according to claim 1 characterized by having further the interpolation multiplier table which outputs a weighting multiplier required to carry out the interpolation operation of the value of a pixel with said interpolation operation means corresponding to the conversion address outputted by said address translation means.

[Claim 3] Said address translation means is an image-distortion amendment method according to claim 1 characterized by being a means to perform horizontal address translation at least among vertical address translation and horizontal address translation.

[Claim 4] Said interpolation operation means performs a interpolation operation between 2 pixels of contiguity of the conversion address, when performing only horizontal address translation, and it is horizontal and an image-distortion amendment method according to claim 3 characterized by being constituted so that a interpolation operation may be performed with the value of 4 pixels near the conversion address when performing vertical address translation.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is suitable for using for the television interphone which can photo a visitor's face and figure with a television camera, and can carry out a monitor check in a residence in a general residence or an apartment about the image-distortion amendment method which amends the geometric distortion of the input image produced with the image pick-up lens of a television camera etc. on real time.

[0002]

[Description of the Prior Art] The television camera in which it has 60 degrees at a level include angle, and it has the visual field of about 45 degrees at a vertical include angle was used for the image pick-up range of the conventional television interphone in many cases. In this case, the geometric distortion of the input image produced with a camera lens etc. is not the forge fire worried to human being's eyes, and did not need to amend an image distortion. However, when there were height of a visitor's height and a motion, the visitor might separate from the screen from the limit of an angle of visibility. Then, although the method which carries out include-angle adjustment of the television camera mechanically was also considered since an angle of visibility was increased, there were problems, like the endurance and passing speed of an actuator are slow.

[0003]

[Problem(s) to be Solved by the Invention] As mentioned above, by the conventional television interphone, if a television camera is mechanically moved in order for there to be a trouble that an angle of visibility is narrow and to obtain the large visual field range, the possibility of failure will become high and the problem that passing speed is slow will also be produced. Then, although extending the visual field range by using super-wide angle lenses, such as a fish-eye lens, as a camera lens was also considered, the problem of producing a big distortion was in the image in that case.

[0004] This invention is made in view of the above points, and the place made into the object is to offer the image-distortion amendment method which can moreover suppress degradation of image quality to the minimum, making large the visual field range of a television camera using super-wide angle lenses, such as a fish-eye lens.

[0005]

[Means for Solving the Problem] If it is in the image-distortion amendment method of this invention, in order to solve the above-mentioned technical problem An A/D-conversion means 1 to digitize an input picture signal, and a synchronizing signal separation means 3 to separate a synchronizing signal from an input picture signal, An address-generation means 4 to generate the screen address from a synchronizing signal, and an address translation means 5 to change the screen address so that an image distortion may be amended, The interpolation operation means 7 which carries out the interpolation operation of the value of a pixel based on the screen address after conversion, It is characterized by having the image memory 8 which memorizes the value of the pixel by which the interpolation operation was carried out, a D/A conversion means 9 to analog-ize the value of the pixel memorized in the image memory 8, and a

synchronizing signal mixing means 10 to mix a synchronizing signal to the analog-ized picture signal.
[0006]

[Function] In this invention, an input picture signal is digitized with the A/D-conversion means 1. Based on the synchronizing signal separated by the synchronizing signal separation means 3, the address-generation means 4 generates the screen address. Change this screen address with the address translation means 5, amend an image distortion, and the interpolation operation of the value of a pixel is further carried out with the interpolation operation means 7 based on the screen address after conversion. Make an image memory 8 memorize the value of the interpolated pixel, and it analog-izes with the D/A conversion means 9. Since a synchronizing signal is mixed with the synchronizing signal mixing means 10 It is what can amend the image distortion contained in the input picture signal, and can acquire the output picture signal of good image quality. moreover, even when it exists while the address after conversion by the address translation means 5 is a pixel Based on the value of the pixel which adjoins with the interpolation operation means 7, the value of the pixel of the address after conversion can be calculated with a sufficient precision, and there is an operation that image quality is improved compared with the case where a interpolation operation is not performed.

[0007]

[Example] Drawing 1 is the block diagram showing the configuration of one example of this invention. An input picture signal is digitized with the A/D-conversion means 1, and is written in the input image data buffer 2. The input image data buffer 2 consists of a FIFO memory, synchronizes the digitized picture signal with an A/D-conversion clock, and writes it in by 1 level line. Moreover, with the synchronizing signal separation means 3, the synchronizing signal is separated from the input picture signal, and each circuit operates based on this synchronizing signal. With the address-generation means 4, the two-dimensional address (X, Y) is generated based on a synchronizing signal. This address (X, Y) is the address before distortion is amended, and consists of the horizontal X address and the vertical Y address. It is changed into the two-dimensional address (x Y) which distortion is amended only about the direction of X with the address translation means 5, and consists of the level address x after conversion, and the original vertical address Y in this example.

[0008] This address translation means 5 mathematizes the property of the image distortion produced with the lens of a television camera etc., calculates the conversion address, and stores the integral part of that count result in a memory table beforehand. When the decimal part of the count result of the conversion address is stored in the interpolation multiplier table 6 at this time and the memory table of the address translation means 5 is accessed, it is made to read as a correction factor simultaneously. Of course, what is necessary is for it to become unnecessary to store the integral part of a count result in the memory table for address translation beforehand, and to store the decimal part of a count result in the interpolation multiplier table 6 beforehand, to make the integral part of the output of an arithmetic circuit into the conversion address as it is, and just to use a decimal part as a correction factor as it is, if the high-speed arithmetic circuit which can carry out the real number operation of the conversion address on real time is used as an address translation means 5.

[0009] Here, it has composition as shown in drawing 2, and the memory table as an address translation means 5 serves as the level address of the input image which the data x by which reading appearance is carried out corresponding to the input address (X, Y) should refer to. Here, since 1-dimensional address translation is performed, the vertical address is still Y. For example, if the input address (X, Y) becomes (2 1), since the data x written in the address concerned of the memory table of drawing 2 will be 43, the reference address (x Y) is set to (43, 1). although image data is serially written in the input image data buffer 2 and it goes to it, there are a method which carries out reading appearance simultaneously and goes, a method read after the writing of 1 level line is completed. the case of the method which carries out reading appearance simultaneously and goes -- reading appearance -- carrying out -- it carries out to the reference address obtained from the address translation table 5, and the data of the reference address (x Y) and the data of the next address (x+1, Y) are sent to the interpolation operation means 7. In the example of drawing 2, the data of (43, 1), and (44, 1) are sent to the interpolation operation means 7. With the interpolation operation means 7, the value (brightness) of the pixel of a conversion coordinate

is calculated by the interpolation multiplier, the data of the reference address, and the data of the next address, and the count result is accumulated in an image memory 8.

[0010] The content of the interpolation operation by the interpolation operation means 7 is shown in drawing 3 R> 3 and drawing 4 . Since the count result (conversion coordinate) of the address translation for distortion amendment does not serve as an integer but it becomes the real number containing a decimal part when an image distortion can be approximated with a certain formula, even if it refers to an input image based on the integral part of the address of the real number, the value of an exact pixel cannot be found. The interpolation operation means 7 acquires the value of a more exact pixel by compensating this and performing linear interpolation from the value of 2 pixels which adjoins horizontally. that is, -- if the count result of the conversion address is made into $x+k$, x is used as the integral part of the conversion address and k is used as the part below decimal point -- linear interpolation -- $x(1-k) D(x)+kxD (x+1)$ from the value D of the pixel in Address $x (x)$, and the value $D (x+1)$ of the pixel in the address $(x+1)$

The interpolation type to say is calculated and let the result be the value of the pixel after address translation. As shown in drawing 3 , the place which the above-mentioned interpolation type means Address x and the data of the point $(x+k)$ of dividing between $(x+1)$ into k : $(1-k)$ It is going to calculate with linear interpolation from the data D in Address $x (x)$, and the data $D (x+1)$ in the address $(x+1)$, and the weight to $D (x)$ and the weight to $D (x+1)$ change according to the interpolation multiplier k , as shown in drawing 4 , respectively.

[0011] The value by which interpolation count was carried out as mentioned above is written in the address under current processing of an image memory 8. Since the data for one screen (one frame or 1 field) are stored in the image memory 8 by performing these processings of a series of one after another, these data are read with the following field or a following frame, and a picture signal is outputted with the D/A conversion means 9 and the synchronizing signal mixing means 10.

[0012] Generally, in order to amend an image distortion, it is necessary to perform two-dimensional address translation. However, effective distortion amendment may be able to be performed only by 1-dimensional address translation like this example. In this example, 1-dimensional address translation of only the level address is performed, by conversion of only the level address, are recording of input image data requires only one line, and a hardware configuration becomes easy.

[0013] Although the above example described only horizontal address translation, naturally processing with the same said of vertical address translation can be performed. Moreover, it is also possible to perform two-dimensional address translation. The content of processing of the interpolation operation in two-dimensional address translation is shown in drawing 5 . Although the interpolation operation was performed in above-mentioned 1-dimensional address translation in adjoining 2 pixels, a interpolation operation is performed in two-dimensional address translation in adjoining 4 pixels. As shown in drawing 5 , when the addresses after the conversion obtained by two-dimensional address translation are $(x+k, y+m)$, the value (brightness) of the pixel after interpolation is $x(1-k) (1-m) xD (x y)$.

+ $1-kxmxD (x y+1)$
 + $kx(1-m) xD (x+1, y)$
 + $kxmxD (x+1, y+1)$

It is come out and given. Here, for the integral part of the level address, and k , the decimal part of the level address and y are $[x /$ the decimal part of the vertical address and $D (x y)$ of the integral part of the vertical address and $m]$ the values of the pixel of the address $(x y)$. If such two-dimensional address translation and a two-dimensional interpolation operation are performed, an image distortion can be amended more to a precision rather than the case where 1-dimensional address translation and a interpolation operation are performed. For example, although the input picture signal from a television camera equipped with a super-wide angle lens (it considers as a rule of thumb and at least 120 horizontal angles of view are) generally has remarkable barrel distortion, if the 1-dimensional address translation about a horizontal direction and a interpolation operation are performed, practically sufficient distortion amendment can be performed, and if level and address translation and a interpolation operation two-dimensional [about a perpendicular direction] are performed, still more precise distortion amendment

can be performed.

[0014]

[Effect of the Invention] Since according to the image-distortion amendment method of this invention the value of the pixel of the address after conversion was calculated by interpolation count between the adjoining pixels while address translation amended the image distortion, when not performing interpolation count, it is effective in being hard to produce degradation of the image quality by address translation.

[0015] In addition, since slack type distortion generated with a lens can be amended and he can watch an image with little image quality degradation on monitor television of the base phone in ** while being able to acquire a large visual field by equipping the television camera of the slave besides ** with a super-wide angle lens, if the image-distortion amendment method of this invention is applied to a television interphone, it is convenient.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the outline configuration of one example of this invention.

[Drawing 2] It is drawing showing the example of a configuration of the translation table used for one example of this invention.

[Drawing 3] It is the explanatory view of the interpolation operation at the time of the-like 1-dimensional address translation of this invention.

[Drawing 4] It is the explanatory view of linear interpolation used for the interpolation operation of this invention.

[Drawing 5] It is the explanatory view of the interpolation operation at the time of the two-dimensional address translation of this invention.

[Description of Notations]

- 1 A/D-Conversion Means
- 2 Input Image Data Buffer
- 3 Synchronizing Signal Separation Means
- 4 Address-Generation Means
- 5 Address Translation Means (Address Translation Table)
- 6 Interpolation Multiplier Table
- 7 Interpolation Operation Means
- 8 Image Memory
- 9 D/A Conversion Means
- 10 Synchronizing Signal Mixing Means

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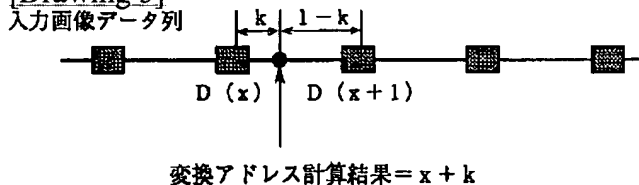
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DRAWINGS

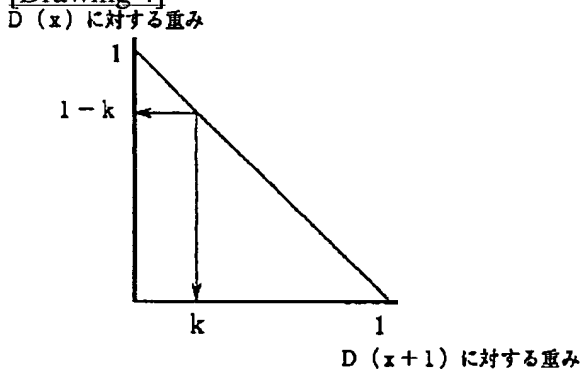
[Drawing 2]

	x													
	42	43	44	45	46	46	47	48	48	...	469	470		
	40	41	42	42	43	44	45	46	46	...	471	472		
Y	42	43	44	45	46	46	47	48	48	...	469	470		
	40	41	42	42	43	44	45	46	46	...	471	472		

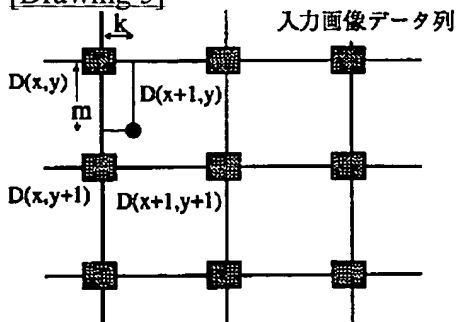
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 1]

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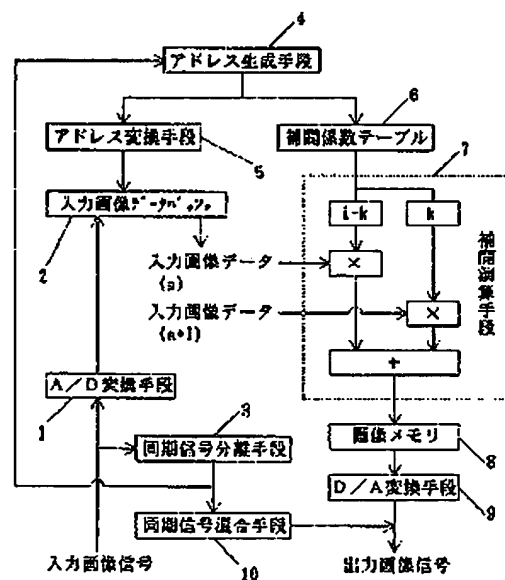
(54)【発明の名称】 画像歪み補正方式

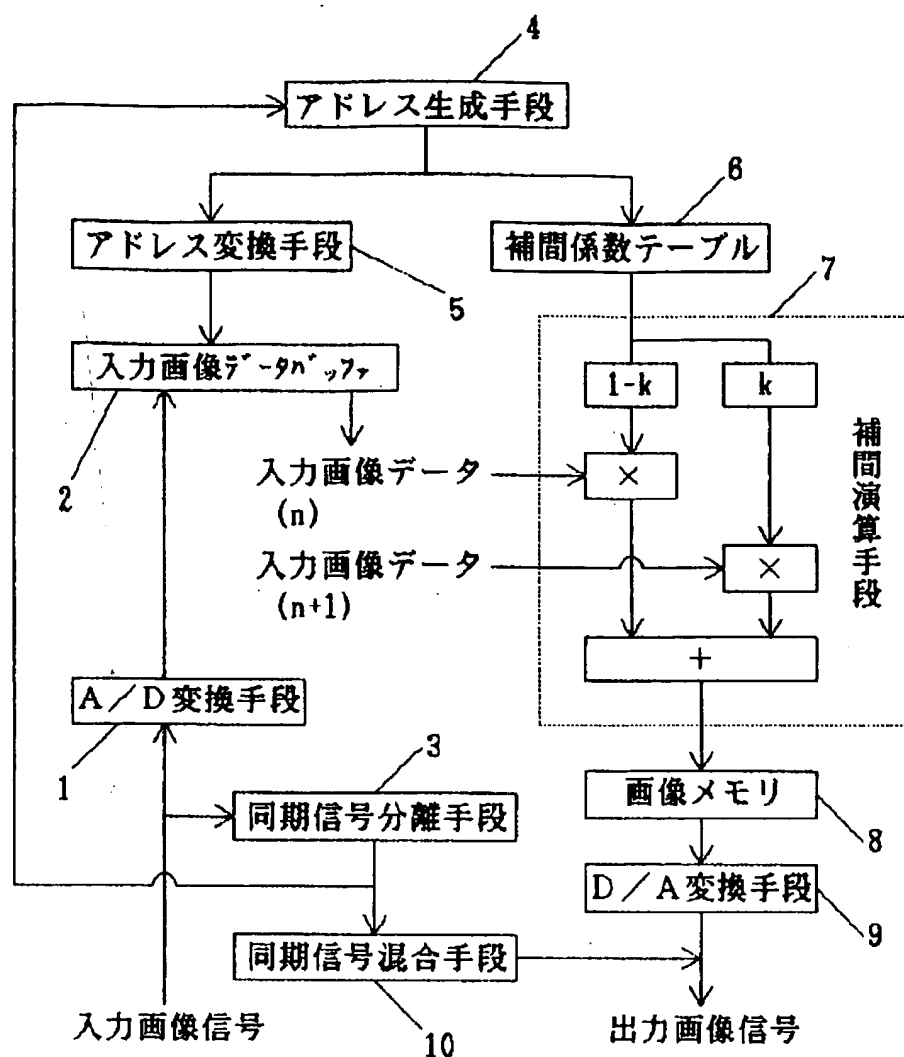
(57)【要約】

【目的】魚眼レンズ等の超広角レンズを使用してテレビカメラの視野範囲を広くしながら、画質の劣化を抑えることができる画像歪み補正方式を提供する。

【構成】画像歪みを補正するように画面アドレスを変換するアドレス変換手段5と、変換後の画面アドレスに基づいて画素の値を補間演算する補間演算手段7を設けた。

【効果】入力画像信号に含まれていた画像歪みを補正して良好な画質の出力画像信号を得ることができ、また、アドレス変換手段5による変換後のアドレスが画素の間に存在する場合でも、補間演算手段7により隣接する画素の値に基づいて、変換後のアドレスの画素の値を精度良く求めることができ、補間演算を行わない場合に比べて画質が改善される。





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【特許請求の範囲】

【請求項1】 入力画像信号をデジタル化するA/D変換手段と、入力画像信号から同期信号を分離する同期信号分離手段と、同期信号から画面アドレスを生成するアドレス生成手段と、画像歪みを補正するように画面アドレスを変換するアドレス変換手段と、変換後の画面アドレスに基づいて画素の値を補間演算する補間演算手段と、補間演算された画素の値を記憶する画像メモリと、画像メモリに記憶された画素の値をアナログ化するD/A変換手段と、アナログ化された画像信号に同期信号を混合する同期信号混合手段とを備えることを特徴とする画像歪み補正方式。

【請求項2】 前記アドレス変換手段により出力される変換アドレスに対応して、前記補間演算手段にて画素の値を補間演算するのに必要な重み付け係数を出力する補間係数テーブルを更に備えることを特徴とする請求項1記載の画像歪み補正方式。

【請求項3】 前記アドレス変換手段は、垂直方向のアドレス変換と水平方向のアドレス変換のうち、少なくとも水平方向のアドレス変換を行う手段であることを特徴とする請求項1記載の画像歪み補正方式。

【請求項4】 前記補間演算手段は、水平方向のアドレス変換のみを行う場合には、変換アドレスの隣接2画素の間で補間演算を行い、水平方向及び垂直方向のアドレス変換を行う場合には、変換アドレスの近傍の4画素の値で補間演算を行うように構成されていることを特徴とする請求項3記載の画像歪み補正方式。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、テレビカメラの撮像レンズ等により生じた入力画像の幾何学的歪みをリアルタイムで補正する画像歪み補正方式に関するものであり、例えば、一般住宅や集合住宅において、来客の顔や姿をテレビカメラで撮影し、住宅内でモニター確認することのできるテレビインターホンに利用するのに適するものである。

【0002】

【従来の技術】従来のテレビインターホンでの撮像範囲は、水平角度で60度、垂直角度で45度程度の視野を持つテレビカメラを使用することが多かった。この場合、カメラレンズ等により生じる入力画像の幾何学的な歪みは、人間の目に気になるほどではなく、画像歪みの補正を行う必要は生じなかった。しかしながら、来客の身長の高低や動きがあると、視野角の制限から来訪者が画面から外れることがあった。そこで、視野角を増すためにテレビカメラを機械的に角度調整する方式も考えられるが、駆動部の耐久性や移動速度が遅いなどの問題があった。

【0003】

【発明が解決しようとする課題】上述のように、従来の

テレビインターホンでは、視野角が狭いという問題点があり、また、広い視野範囲を得るためにテレビカメラを機械的に動かすと、故障の可能性が高くなり、移動速度が遅いという問題も生じる。そこで、魚眼レンズ等の超広角レンズをカメラレンズとして使用することにより視野範囲を広げることも考えられるが、その場合には、画像に大きな歪みを生じるという問題があった。

【0004】本発明は、上述のような点に鑑みてなされたものであり、その目的とするところは、魚眼レンズ等の超広角レンズを使用してテレビカメラの視野範囲を広くしながら、しかも画質の劣化を最小限に抑えることができる画像歪み補正方式を提供することにある。

【0005】

【課題を解決するための手段】本発明の画像歪み補正方式にあっては、上記の課題を解決するために、入力画像信号をデジタル化するA/D変換手段1と、入力画像信号から同期信号を分離する同期信号分離手段3と、同期信号から画面アドレスを生成するアドレス生成手段4と、画像歪みを補正するように画面アドレスを変換するアドレス変換手段5と、変換後の画面アドレスに基づいて画素の値を補間演算する補間演算手段7と、補間演算された画素の値を記憶する画像メモリ8と、画像メモリ8に記憶された画素の値をアナログ化するD/A変換手段9と、アナログ化された画像信号に同期信号を混合する同期信号混合手段10とを備えることを特徴とするものである。

【0006】

【作用】本発明では、入力画像信号をA/D変換手段1によりデジタル化して、同期信号分離手段3により分離された同期信号に基づいて、アドレス生成手段4により画面アドレスを生成し、この画面アドレスをアドレス変換手段5により変換して画像歪みを補正し、さらに、変換後の画面アドレスに基づいて、補間演算手段7により画素の値を補間演算して、補間された画素の値を画像メモリ8に記憶させ、D/A変換手段9によりアナログ化して、同期信号混合手段10により同期信号を混合するようにしたものであるから、入力画像信号に含まれていた画像歪みを補正して良好な画質の出力画像信号を得ることができるものであり、また、アドレス変換手段5による変換後のアドレスが画素の間に存在する場合でも、補間演算手段7により隣接する画素の値に基づいて、変換後のアドレスの画素の値を精度良く求めることができ、補間演算を行わない場合に比べて画質が改善されるという作用がある。

【0007】

【実施例】図1は本発明の一実施例の構成を示すブロック図である。入力画像信号は、A/D変換手段1でデジタル化されて、入力画像データバッファ2に書き込まれる。入力画像データバッファ2は、例えば、FIFOメモリよりなり、デジタル化された画像信号をA/D変換

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クロックに同期させて1水平ライン分書き込んで行くものである。また、同期信号分離手段3では、入力画像信号から同期信号を分離しており、この同期信号に基づいて各回路が動作する。アドレス生成手段4では、同期信号に基づいて、2次元のアドレス(X, Y)を生成する。このアドレス(X, Y)は、歪みを補正される前のアドレスであり、水平方向のXアドレスと垂直方向のYアドレスよりなる。本実施例では、アドレス変換手段5により、X方向についてのみ歪みを補正されて、変換後の水平アドレスxと元の垂直アドレスYよりなる2次元

10 のアドレス(x, Y)に変換される。
【0008】このアドレス変換手段5は、テレビカメラのレンズ等により生じる画像歪みの特性を数式化し、変換アドレスを計算して、その計算結果の整数部分をメモリーテーブルに予め記憶させたものである。このとき、変換アドレスの計算結果の小数部分は、補間係数テーブル6に記憶させておいて、アドレス変換手段5のメモリーテーブルをアクセスしたときに、同時に補正係数として読み出すようにしておく。もちろん、アドレス変換手段5として、変換アドレスをリアルタイムで実数演算できる

20 高速度の演算回路を使用すれば、計算結果の整数部分をアドレス変換用のメモリーテーブルに予め記憶させる必要はなく、また、計算結果の小数部分を補間係数テーブル6に予め記憶させる必要もなくなり、演算回路の出力の整数部分をそのまま変換アドレスとし、小数部分をそのまま補正係数として使用すれば良い。
【0009】ここで、アドレス変換手段5としてのメモリーテーブルは、例えば、図2に示すような構成となっており、入力アドレス(X, Y)に対応して読み出されるデータxが参照すべき入力画像の水平アドレスとなる。ここでは、1次元のアドレス変換を行っているため、垂直アドレスはYのままである。例えば、入力アドレス(X, Y)が(2, 1)ならば、図2のメモリーテーブルの当該アドレスに書き込まれたデータxは43であるので、参照アドレス(x, Y)は(43, 1)となる。入力画像データバッファ2には、逐次画像データが書き込まれて行くが、同時に読み出して行く方式や、1水平ラインの書き込みが終了してから読み出す方式等がある。同時に読み出して行く方式の場合には、読み出しはアドレス変換テーブル5から得た参照アドレスまで行い、参照

40 参照アドレス(x, Y)のデータ及びその次のアドレス(x+1, Y)のデータを補間演算手段7に送る。図2の例では、(43, 1)と(44, 1)のデータを補間演算手段7に送る。補間演算手段7では、補間係数と、参照アドレスのデータ及びその次のアドレスのデータで変換座標の画素の値(明るさ)を計算し、その計算結果を画像メモリ8に蓄積する。
【0010】補間演算手段7による補間演算の内容を図3及び図4に示す。画像歪みを或る数式で近似できる場合、歪み補正のためのアドレス変換の計算結果(変換座

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標)は整数とはならず、小数部分を含む実数となるため、実数のアドレスの整数部分に基づいて入力画像を参照しても正確な画素の値は求まらない。補間演算手段7は、これを補償するものであり、例えば、水平方向に隣接する2画素の値から線形補間を行うことにより、より正確な画素の値を得るものである。つまり、変換アドレスの計算結果をx+kとし、xを変換アドレスの整数部分、kを小数点以下の部分とすると、線形補間では、アドレスxでの画素の値D(x)とアドレス(x+1)での画素の値D(x+1)から、

$$(1-k) \times D(x) + k \times D(x+1)$$

という補間式を演算し、その結果を変換後の画素の値とするものである。上記の補間式の意味するところは、図3に示すように、アドレスxと(x+1)の間をk:(1-k)に分割する点(x+k)のデータを、アドレスxでのデータD(x)とアドレス(x+1)でのデータD(x+1)から直線的な補間により計算しようとするものであり、D(x)に対する重みと、D(x+1)に対する重みは、それぞれ図4に示すように、補間係数kに応じて変化する。

【0011】以上のようにして、補間計算された値を画像メモリ8の現在処理中のアドレスに書き込む。これらの一連の処理を次々を行うことにより画像メモリ8に1画面分(1フレーム又は1フィールド)のデータが蓄積されるので、これらのデータを次のフィールド又はフレームで読み出し、D/A変換手段9及び同期信号混合手段10で画像信号を出力するものである。

30 【0012】一般的に、画像歪みの補正を行うには、2次元のアドレス変換を施す必要がある。しかしながら、本実施例のように、1次元のアドレス変換のみで有効な歪み補正を行うことができる場合もある。本実施例では、水平アドレスのみの1次元のアドレス変換を行うものであり、水平アドレスのみの変換では、入力画像データの蓄積が1ライン分だけでよく、ハードウェア構成が簡単になる。

【0013】以上の実施例では、水平方向のアドレス変換についてのみ述べたが、当然、垂直方向のアドレス変換についても同様の処理を行うことができる。また、2次元のアドレス変換を行うことも可能である。図5に2次元のアドレス変換における補間演算の処理内容を示す。上述の1次元のアドレス変換では、隣接する2画素間で補間演算を行っていたが、2次元のアドレス変換では隣接する4画素間で補間演算を行うものである。図5に示すように、2次元のアドレス変換により得られた変換後のアドレスが(x+k, y+m)である場合には、補間後の画素の値(明るさ)は、

$$\begin{aligned} & (1-k) \times (1-m) \times D(x, y) \\ & + (1-k) \times m \times D(x, y+1) \\ & + k \times (1-m) \times D(x+1, y) \\ & + k \times m \times D(x+1, y+1) \end{aligned}$$

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で与えられる。ここで、 x は水平アドレスの整数部分、 k は水平アドレスの小数部分、 y は垂直アドレスの整数部分、 m は垂直アドレスの小数部分、 $D(x, y)$ はアドレス (x, y) の画素の値である。このような2次元のアドレス変換と補間演算を行えば、1次元のアドレス変換と補間演算を行う場合よりも、より精密に画像歪みを補正できる。例えば、超広角レンズ(目安として水平画角120度位)を備えるテレビカメラからの入力画像信号は一般的にかなりの樽形歪みを有するが、水平方向についての1次元のアドレス変換と補間演算を行えば、実用上は十分な歪み補正を行うことができ、水平及び垂直方向についての2次元のアドレス変換と補間演算を行えば、さらに精密な歪み補正を行うことができる。

【0014】

【発明の効果】本発明の画像歪み補正方式によれば、アドレス変換により画像歪みを補正すると共に、変換後のアドレスの画素の値を隣接する画素間の補間計算により求めるようにしたので、補間計算を行わない場合に比べると、アドレス変換による画質の劣化が生じにくいという効果がある。

【0015】なお、本発明の画像歪み補正方式をテレビインターホンに適用すれば、宅外の子器のテレビカメラに超広角レンズを装着することにより、広い視野を得ることができると共に、レンズにより発生する樽形歪みを*

* 補正して、画質劣化の少ない画像を宅内の観るのモニターテレビで見ることができるので、好都合である。

【図面の簡単な説明】

【図1】本発明の一実施例の概略構成を示すブロック図である。

【図2】本発明の一実施例に使用する変換テーブルの構成例を示す図である。

【図3】本発明の1次元的なアドレス変換時の補間演算の説明図である。

10. 【図4】本発明の補間演算に用いる線形補間の説明図である。

【図5】本発明の2次元的なアドレス変換時の補間演算の説明図である。

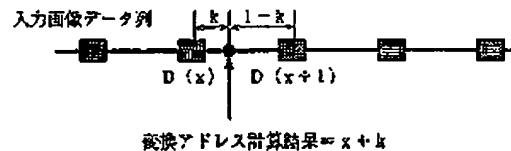
【符号の説明】

- 1 A/D変換手段
- 2 入力画像データバッファ
- 3 同期信号分離手段
- 4 アドレス生成手段
- 5 アドレス変換手段(アドレス変換テーブル)
- 6 補間係数テーブル
- 7 補間演算手段
- 8 画像メモリ
- 9 D/A変換手段
- 10 同期信号混合手段

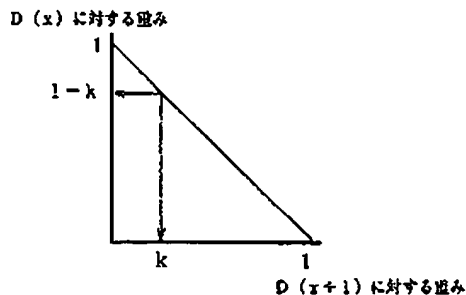
【図2】

		x																	
y		42	43	44	45	46	47	48	49	...	469	470							
		40	41	42	43	44	45	46	47	...	471	472							
		42	43	44	45	46	47	48	49	...	469	470							
		40	41	42	43	44	45	46	47	...	471	472							

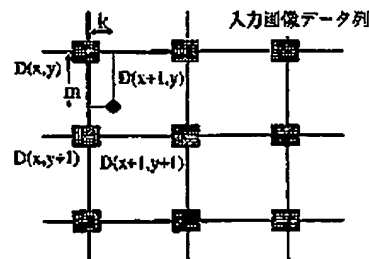
【図3】



【図4】



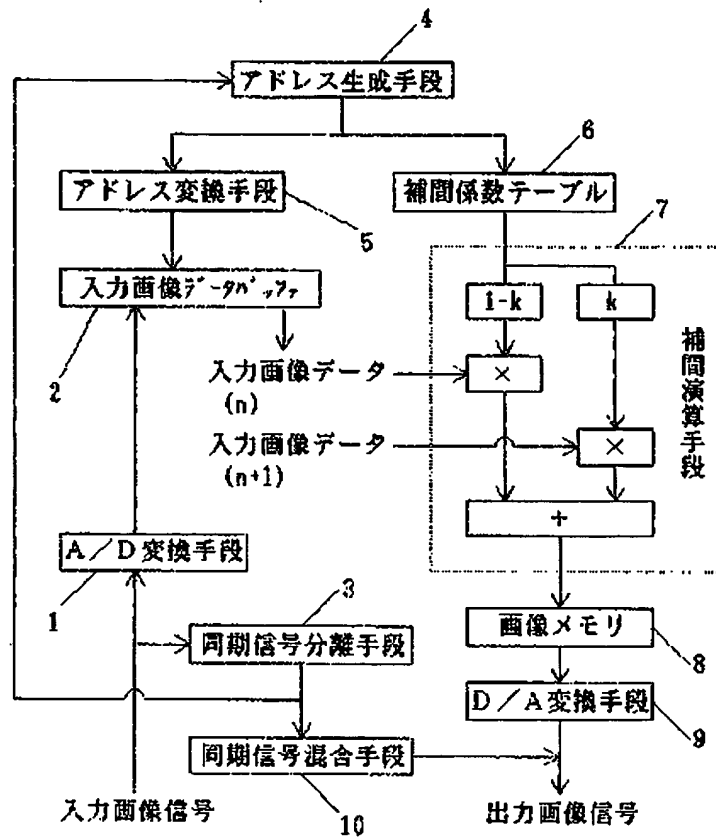
【図5】



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【図1】



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